Following *Garkman*, the frog, in North Eastern Arnhem Land (Australia)[1]

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ABSTRACT

The research presented here focused on the ethnozoology of frogs as viewed by two Aboriginal communities: Gängan and Gapuwiyak, which are both located in north-east Arnhem Land (Yolngu territory), Northern Territory. The aim of this research was to record traditional Aboriginal knowledge about frogs as viewed by Dhalwangu, a Yolngu clan. Particular emphasis was placed on amphibian traditions and beliefs, local nomenclature, and natural history as conceived by the Dhalwangu. A full understanding of the symbolism of *Garkman*, the frog, and its relatedness to other aspects of the culture is only beginning to be realised by the researchers.

Traditional ecological knowledge illustrates how Aboriginal people have learned to survive and live in their environment, but the gradual loss of such knowledge (especially with the death of senior men and elders) and the devastation of ecosystems by invasive pests threaten local traditional knowledge. For example, the recent spread of the introduced cane toad (*Bufo marinus*) into Yolngu land is expected to have some impact on native species of frog and the broader-ecosystem which they inhabit, but also cultural effects, including loss of traditional food and alteration of totem species. This paper describes the significance of frogs to the Gängan and Gapuwiyak communities, assesses frog biodiversity in Yolngu territory according to indigenous knowledge, attempts to document the changes in frog biodiversity currently occurring as a result of environmental impacts such as growing populations of the cane toad, and points to the cultural significance of these changes.

Key words: ethnozoology, amphibians, frogs, cane toad, folk beliefs, Aborigines, Yolngu, Arnhem Land, Australia.

Introduction

There has been relatively little documentation of the biodiversity and conservation values in freshwater areas of north-east Arnhem Land. With few exceptions, most of the published information derives from a few collecting expeditions (mainly the landmark 1948 American-Australian Scientific Expedition) or is ancillary information collected during anthropological studies (most notably by D. Thomson in the 1930s and more recently by Davis and Rudder in the 1980s and 90s). In contrast to the slim chronicle of published information, traditional Aboriginal landowners have maintained an extraordinarily detailed knowledge of their environments and the biota in north-east Arnhem Land. Much of that region has been little modified by European influence (Gambold *et al.* 1995:43) and the environment has maintained integrity. Compared with the recent loss of wildlife in most areas in Australia, the wildlife of north-east Arnhem Land is notable for its apparent intactness (Gambold *et al.* 1995). To date only a small fraction of Yolngu ethno-ecological knowledge has been recorded (Boll 2002, 2005; Davis 1989; Heath 1978; Gambold *et al.* 1995; Lindsay *et al.* 2001; Rudder 1979, 1999; Seaton and Bradley 2004; Waddy 1988) and a rich compendium of such information is under threat as elders pass away and younger members of the community cease to follow traditional ways.

Data were collected for this present study during two research periods, August to December 2002 and February to June 2005, on Yolngu and more specifically on Dhalwangu land at Gängan outstation, but also in Gapuwiyak, Yirrkala (community and Buku-Larrnggay Art Centre) and Nhulunbuy. In total, 12 species of frog and one species of toad were identified during surveys of the Gängan and Gapuwiyak communities (*Crinia remota*, *Cyclorana australis*, *Limnodynastes convexiusculus*, *Limnodynastes ornatus*, *Litoria bicolor*, *Litoria caerulea*, *Litoria nasuta*, *Litoria rothii*, *Litoria rubella*, *Litoria torneri*, *Litoria wotjulmensis*, *Uperolea inundata* and *Bufo marinus*). Non-breeding seasonal conditions and possibly the presence of the cane toad have resulted in a largely preliminary species list for these two communities in north-east Arnhem Land.

Amphibians are of value to humans for their scientific, cultural, ecological and aesthetic worth (Boll 2000; Basgösz 1980; Jacoby and Spiegelberg 1903; Levêque 1999) and they play a critical role in ecosystems (Alford and Richards 1999; Alford *et al.* 2001). The Yolngu have an extensive and intensive knowledge of their environment and the different species (fauna and flora) surrounding them. They value wildlife for its nutritional, cultural and spiritual properties. This paper presents research that focused on the cultural relationship between Dhaḻwangu people and the frog, *Garkman*. For Dhaḻwangu people some natural species are regarded as being more important than others. *Garkman* is the generic Yolngu name for all the frog species. "We call the frog *Garkman*, there is only one *Garkman*, nothing else. English people call it frog but we call it *Garkman*; there is only one *Garkman*; only one name, I mean, one name *Garkman* for every *Garkman*, small or big" (personal communication, Gawirriṉ Gumana). *Garkman* is the name of the green tree frog (*Litoria caerulea*), the totem frog.

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[1] This paper is in a series on the theme of human-animal studies, edited by Natalie Lloyd and Jane Mulcock for *Australian Zoologist* (Lloyd and Mulcock *Australian Zoologist* 2006 33: 290-94).

Traditional knowledge and beliefs about frogs in north-east Arnhem Land may be at risk of changing or disappearing as native frogs come under the threat of introduced species, such as the cane toad *Bufo marinus*. The disappearance of native species (like frogs, tortoises) will generate an alteration of totem species, which will involve an alteration of traditional ceremonies. The cane toad was deliberately introduced to Australia from Hawaii, in 1935, in an attempt to stop both the Greyback cane beetle (*Dermolepida albohirtum* Waterhouse) and the Frenchi Beetle (*Lepidiota frenchi* Blackburn) from destroying sugar cane crops in North Queensland (Covacevich and Archer 1975: 305). The toads were unsuccessful in controlling the cane beetles but successfully spread south into New South Wales and north-west into the Northern Territory. *Bufo marinus* possess large, paired parotid glands located dorsally on the neck, which produce a poisonous milky substance. Eggs, tadpoles and adults are poisonous. According to van Beurden, 'the potency of cane toad toxin renders it lethal to most frog-eating vertebrates and others that might inadvertently ingest it' (1980; Covacevich & Archer 1975; van Dam *et al.* 2002). *B. marinus* was first seen in north-east Arnhem Land in 1999, in the remote Gapuwiyak community, and later in early 2000, in the Gäṉgaṉ outstation (Boll 2005: 89). In March 2001, *B. marinus* reached the wetlands of heritage-listed Kakadu National Park (Watson and Woinarski 2003; Van Dam et *al* 2001). The direct effects of *B. marinus* on native frogs and their indirect effects on Yolngu culture are not known.

Study Area and Biological Literature

Gäṉgaṉ is situated about 200 km south-southwest of Nhulunbuy and about 60 km inland from the coast, east of Blue Mud Bay (Figs.1 and 5). Gapuwiyak is located about 215 km south-west of Nhulunbuy and 20 km inland from the coast, south of Warranyin (Figs.2 and 5). North-east Arnhem Land is situated in the wet – dry tropics in Northern Australia and experiences strong seasonal climate changes. During the wet season (Dec.-Feb.) maximum temperatures reach approximately 36ºC, about 80% relative humidity and maximum rainfall averages 344 mm per month. In contrast, dry season (Jun.-Aug.) minimum temperatures are around 12ºC, relative humidity about 63% and maximum rainfall averages only 3 mm per month (Bureau of Meteorology 2005).

Gäṉgaṉ and Gapuwiyak mainly have well draining sandy soils, which sometimes contain laterite gravel. This gravel supports many different vegetation communities (Yunupingu *et al.* 1995). Major geographical landmarks include the Ludtanba River in Gäṉgaṉ (Fig.3) and Lake Evella in Gapuwiyak (Fig.4). The Ludtanba River is important both for providing food staples, such as fish, and for its cultural significance to Dhaḻwangu. Lake Evella is about 1.2 by 1km in size, and generally retains water all year. Although Lake Evella is not relied on for food to the same extent as the Ludtanba River is for the Gäṉgaṉ residents, the lake has great cultural significance to both Gupapuyngu and Dhaḻwangu, which are two of the 13 clans (both *Yirritja* and *Dhuwa*) living in Gapuwiyak.

Based on available biological literature, between 11 and 25 frog species can be found in Arnhem Land (Dept. of the Environment And Heritage 2005; Specht 1948; Tyler and Davies 1986). In north-east Arnhem Land, the most recent survey (1995) of Cape Arnhem mentions 13 frog species (Gambold *et al.* 1995).

Methods

Research[1], including interviews and surveys, was conducted in north-east Arnhem land, northern Australia, over two periods (Fig.5). In 2002, over a 5 month period, I conducted research in Gäṉgaṉ (Fig. 6). In 2005, also over a 5 month period, I conducted research in Gapuwiyak (Fig.7), although Gäṉgaṉ was briefly revisited. During both of these research periods, time was also spent with rangers from Dhimurru Land Management Aboriginal Corporation in Nhulunbuy. Regular visits were made to the Buku-Larrnggay Art Centre in Yirrkala to check the latest artworks (bark paintings, carvings and memorial poles) depicting frogs. These were mainly done by Dhaḻwangu people. After recording the information provided for each artwork at the art centre, I tried to meet the artists and collect more information either about the specific artwork or about *Garkman*, the frog, more generally.

Informal and open-ended interviews were conducted with key informants[3] (mainly men). Presenting pictures of animals and paintings was useful in starting conversation and for clarifying information gathered in a separate study (May-Jun. 2001). Some data pertaining to sites of restricted access were of a ritual nature (men's business), however, Gawirriṉ Gumana permitted me to visit some of these places and shared information to improve my understanding of related stories and concepts in an effort to record such knowledge for future generations. As well as conducting interviews, I also participated in many activities, especially fishing trips, and in social activities at Gäṉgaṉ outstation and in the Gapuwiyak community.

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[1] Both of these research periods were funded by the Australian Institute of Aboriginal and Torres Strait Islander Studies in Canberra. Animal ethics clearance (A02017) was provided by Charles Darwin University. Permission to enter indigenous land was provided by the Northern Land Council (SPEC1), Dhimurru (Land Management Aboriginal Corporation based in Nhulunbuy; N° 5319), Gawirriṉ Gumana, elder in Gäṉgaṉ and the Gapuwiyak Community Council.

[3] Gawirriṉ Gumana, a Dhaḻwangu elder, Nawurapu and Balku Wunungmurra, and a few other Dhaḻwangu people in Gäṉgaṉ and in Gapuwiyak, Micky, Bobby, Donald, and Trevor Wunungmurra.

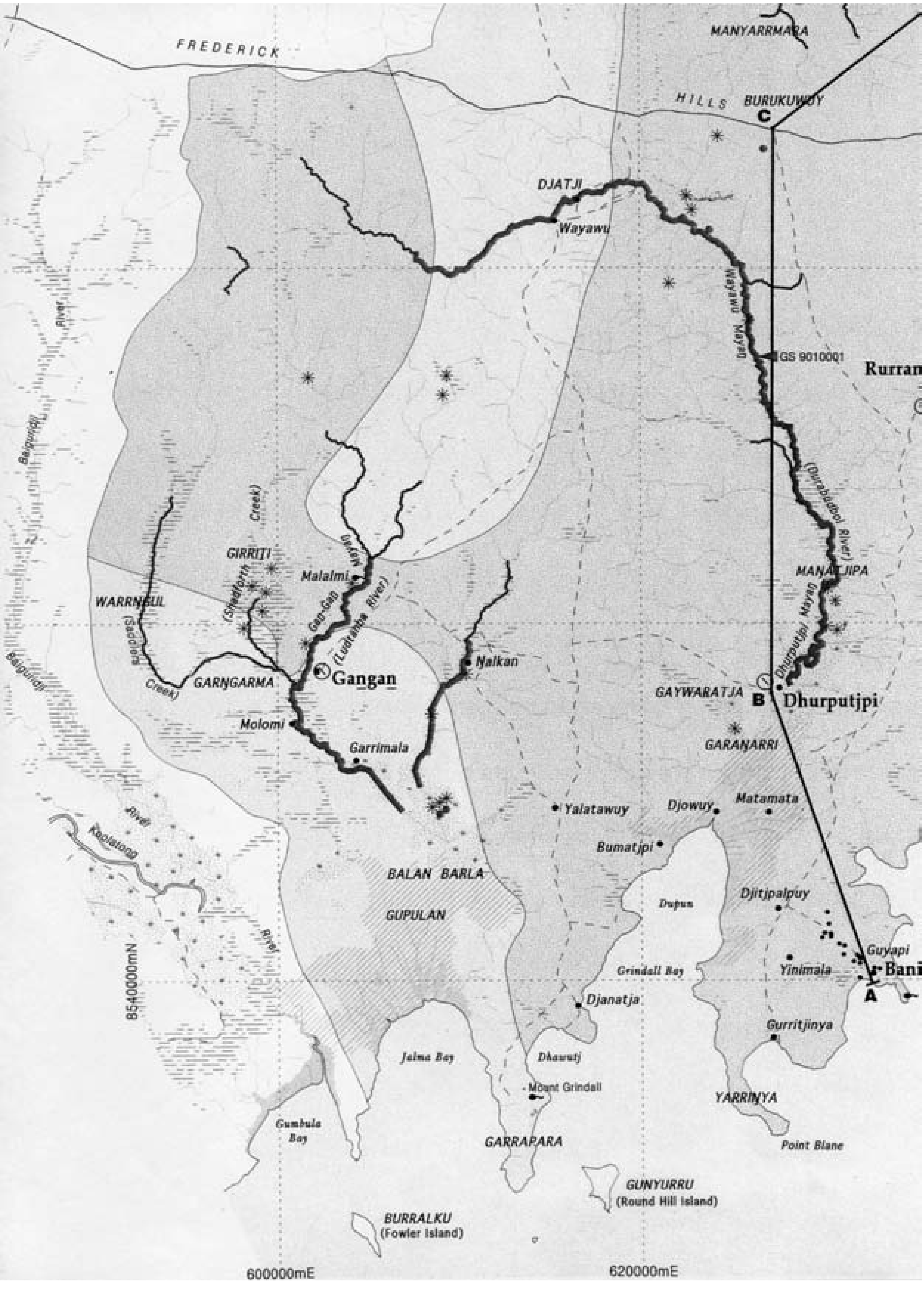
FREDERICK
HILLS
MANYARRMARA
BURUKUWUY
C
DJATJI
Wayawu
Wayawu Mayali
GS 9010001
Rurran
(Durabudboi River)
MANATJIPA
Dhurputjpi Mayali
B
Dhurputjpi
GAYWARATJA
GARANARRI
GIRRITI
(Shetforth Creek)
Malalmi
Gan-Gan
Mayali
(Ludamba River)
WARRNGUL
(Saddlers Creek)
GARNGARMA
Gangan
Nalkan
Molomi
Garrimala
Baiguridji River
Koolatong River
Yalatawuy
Djowuy
Matamata
Bumatjpi
BALAN BARLA
GUPULAN
Dupun
Djitjpalpuy
Guyapi
Bani
Yinimala
A
Grindall Bay
Djanatja
Gurritjinya
Jalma Bay
Dhawutj
Mount Grindall
YARRINYA
Gumbula Bay
GARRAPARA
Point Blane
GUNYURRU
(Round Hill Island)
BURRALKU
(Fowler Island)
8540000mN
600000mE
620000mE

Figure1. Map of Gängan (Detail from the map "Water resources in N. E. Arnhem Land", Department of Lands, Planning and Environment, Palmerston).

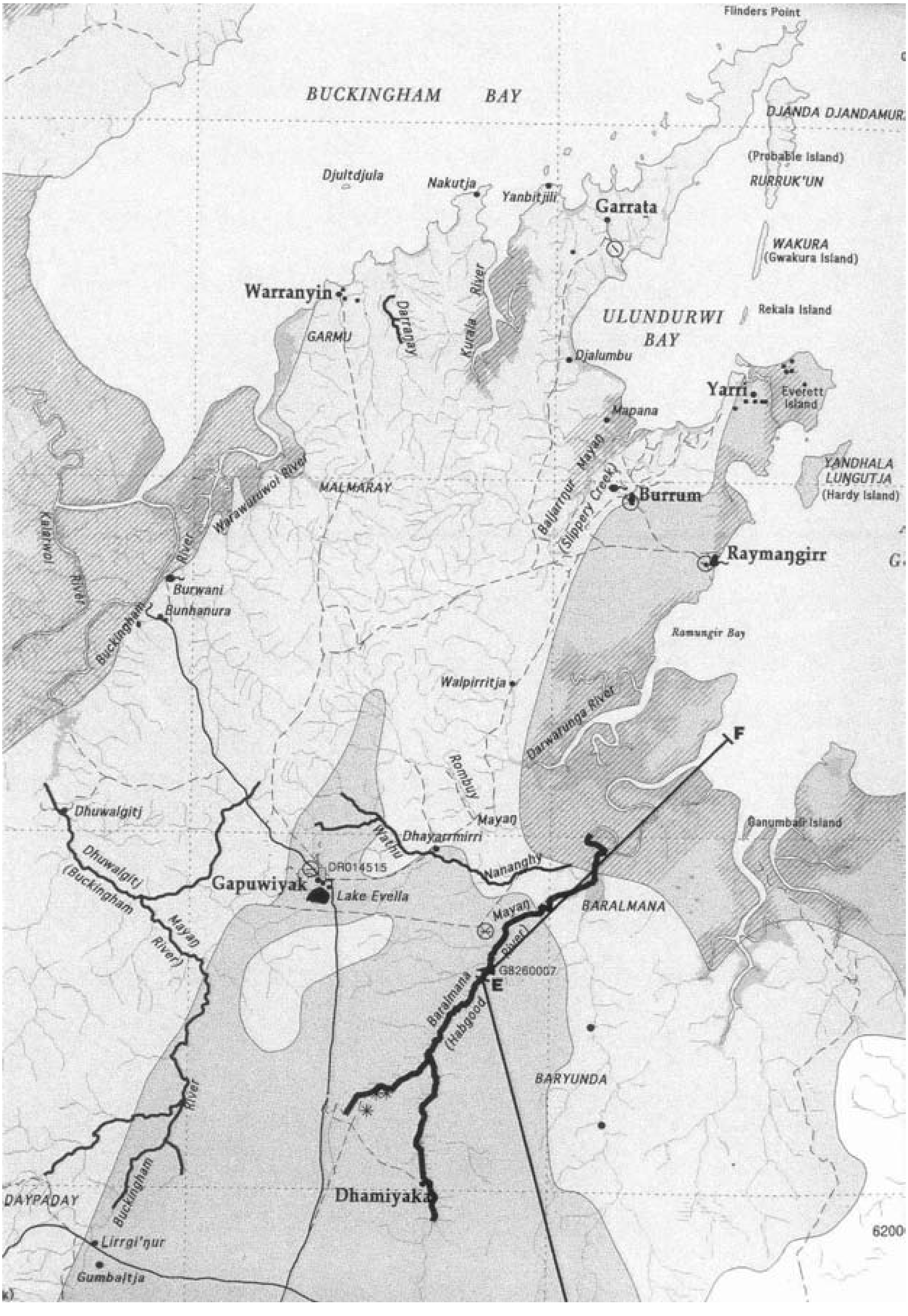
Flinders Point
BUCKINGHAM BAY
DJANDA DJANDAMUR
(Probable Island)
RURRUK'UN
Djultdjula
Nakutja
Yanbitjili
Garrata
WAKURA
(Gwakura Island)
Warranyin
Darranay
Kurala River
ULUNDURWI BAY
Rekala Island
GARMU
Djalumbu
Yarri
Everett Island
Mapana
Baljarrur Mayaŋ
(Slippery Creek)
YANDHALA LUŊGUTJA
(Hardy Island)
Warawuruwoi River
MALMARAY
Burrum
Kalarwoi River
Raymaŋgirr
Buckingham River
Burwani
Bunhanura
Ramangir Bay
Walpirritja
Darwarunga River
F
Rombuy Mayaŋ
Ganumbalr Island
Dhuwalgitj
Wathu
Dhayarrmirri
Wanangby
DR014515
Gapuwiyak
Lake Evella
Dhuwalgitj (Buckingham Mayaŋ River)
BARALMANA
Mayaŋ River
G8260007
E
Baralmana (Habgood)
BARYUNDA
River
Buckingham
DAYPADAY
Dhamiyaka
6200
Lirrgi'ŋur
Gumbaltja

Figure 2. Map around Gapuwiyak (Detail from the map "Water resources in C. E. Arnhem Land", Department of Lands, Planning and Environment, Palmerston).

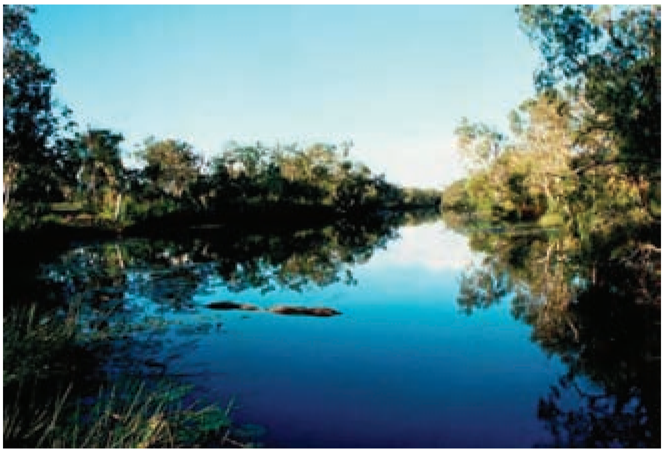

Figure 3. Gängan *Mayan* (River).

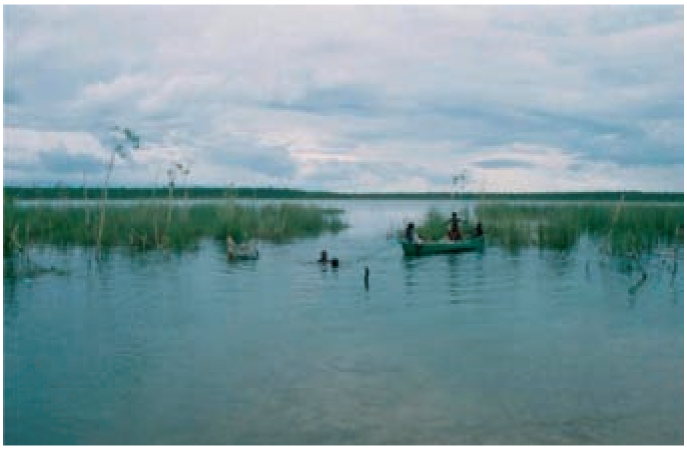

Figure 4. Lake Evalla, Gapuwiyak.

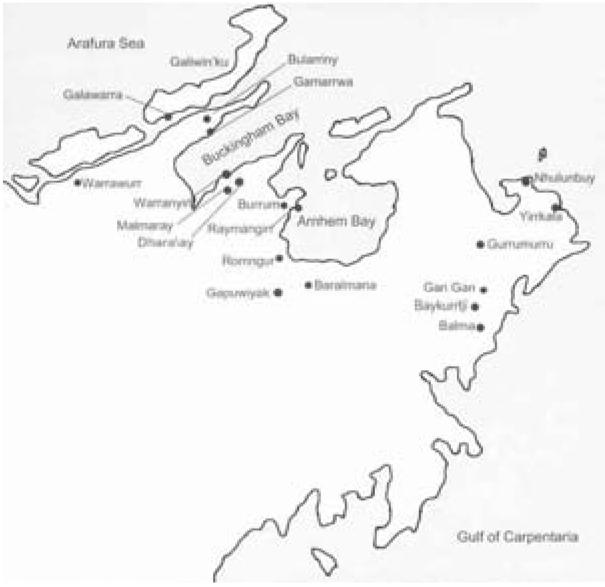
Arafura Sea
Galiwin'ku
Bulanny
Gamarrwa
Galawarra
Buckingham Bay
Warrawurr
Warranyin
Malmaray
Dharaway
Burrum
Raymangirr
Arnhem Bay
Romngur
Gapuwiyak
Baralmana
Nhulunbuy
Yirrkala
Gurrumurru
Gan Gan
Baykurrtji
Balma
Gulf of Carpentaria

Figure 5. Map of N. E. Arnhem Land (Brown *et al* 2002: 10)

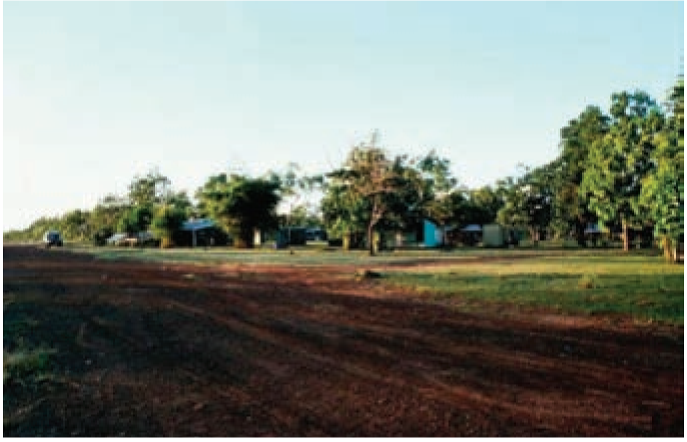

Figure 6. Gängan outstation

Figure 7. Gapuwiyak.

Discussion

The Yolngu physical and spiritual universe is divided into two exogamous patrilineal moieties[2]: *Dhuwa* and *Yirritja*. The Dhalwangu is one of the 8 clans that belong to the *Yirritja* moiety. They speak a language called *Dhay'yi* or *Dayi*, a *Yirritja* language (also spoken by the Djarrwak clan). Currently, only about 200 people continue to use this language. Each clan has its own stories, totems, designs, songs and symbols. "Although Gängan is Dhalwangu clan land, the area is also of great spiritual significance to all *Yirritja* clans, for it was here that the three most important *Wangarr* (Ancestral being) of the *Yirritja* moiety first appeared to Yolngu people" (Hutcherson 1995:13).

The story of Barama[4], Lany'tjung[5] and Galparimun (three of the main *Yirritja* Ancestral Beings) broadly shapes the ancestral significance of the Dhalwangu country. Barama came out of the waters of the Gängan River, brought the sacred Law: totems, ceremonies, designs, songs and dances (which are now owned and re-enacted by the various *Yirritja* clans) and also named places and animals. He named amongst others *Garkman*, the frog.

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[2] One of the two units/halves into which a tribe is divided on the basis of unilateral descent. The division into moieties applies to the whole universe, so Ancestral Beings, plants, animals, and natural features belong to just one moiety either *Yirritja* or *Dhuwa*.

[4] Barama: a Dhalwangu ancestral being who created Dhalwangu language and culture and gave form to the country in Gängan.

[5] Lany'tjung: a Dhalwangu ancestral being who helped to create Dhalwangu language and culture and gave form to the country in Gängan.

> *Garkman*, the frog lives somewhere around Girriti, a monsoon forest along the Shadforth Creek. He is staying around here, moving around, from place to place, in the water and on the land. The rain came and *Garkman* was washed away, far away to Baraltja and Garraparra. He went into the sea, into saltwater; but frogs can't live in saltwater. He finally landed on Gunyurru Island, died, and changed into a rock, but his spirit still is in the water. On the back of the rock there is a water hole [*Garkman*'s back] and it is the only place on the island where you can find freshwater (personal communication Gawirrin̲ Gumana [Shortened version]).

Allen (1975:60-66) has presented a story of Lany'tjung[6] where the frog was mentioned twice; first, when Lany'tjung was going to the sacred pool, Gululdji, to talk with the barramundi, the tortoise, and the frog; and later, when the frog dove down through the water to his wounded friend, Lany'tjung. The different sites along the Gäṉgan River (country of the Dhal̲wangu clan) are totemically[7] associated with the prevalent animal species (Boll 2002: 100-101). Each animal belongs to or makes their appearance in a specific environment where other animals or ancestral beings also appear and other events occur.

Even though *Garkman* is the generic term for frog for both moieties, all the frogs belong to the *Yirritja* moiety. Bobby Wunungmurra related:

> We don't have names for the different frogs. All the frogs are *Garkman,* but they have names related to the different places or habitats, where you can find them, like:
>
> - *Gapupuy Garkman* (*gapu* = water): frogs found in water.
> - *Dharpapuy Garkman* (*dharpa* = tree): frogs living in trees.
> - *Munatapuy Garkman* (*munata* = sand): frogs living in the sand.
> - *Gungapuy Garkman* (*gunga* = pandanus): frogs living in pandanus.
> - *Mulmupuy Garkman* (*mulmu* = grass): frogs living in the grass.
> - *Larrakitjpuy Garkman* (*larrakitj* = hollow tree): frogs living in hollow logs or trees (personal communication Bobby Wunungmurra).

All my informants told me they use frogs as bait for fishing. Micky Wunungmurra mentioned that he uses green tree frogs (*Litoria caerulea*) and small brown ones (sand dwelling ones; *Crinia remota*). His brother, Bobby, said he prefers *Gungapuy Garkman*, the ones living in pandanus (*Litoria bicolor*).

As Nancy Williams has suggested, naming is an extremely important aspect of the relation of Yolngu people to country (1986: 420; also see White 2003: 187-206 regarding "Meaning and metaphor in Yolngu landscapes"). Peter Toner notes that names and naming are of primary importance for Dhal̲wangu *manikay* (songs). "Each and every place that is significant in Dhal̲wangu cosmology has a multiplicity of names that may be used in song to create a clear picture of that place in the mind's eye of the audience[8]" (2001: 234-35). The totems of the clan are the subjects of the songs, which are performed during ceremonies. My informants mentioned other names used for *Garkman* in *manikay* (songs) such as *Garigari*, *Murnalin*, *Bakpirr*, *Ririririga*, *Wangul* and *Djangal*, but also indicated that only *Yirritja* clans can sing the frog because *Garkman* belongs to the *Yirritja* moiety. For all my informants, *Garkman*, the frog represented in paintings (Fig.8) or carvings, is a green tree frog but only Dhal̲wangu can paint *Garkman* because he is one of their totems (Fig.9).

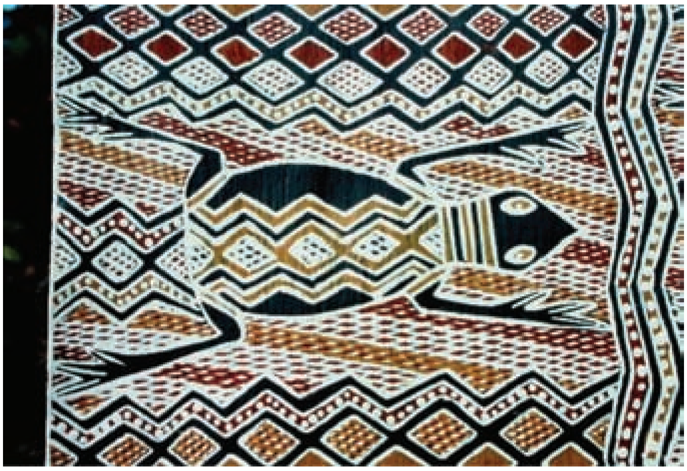

Figure 8. *Garkman,* the frog.

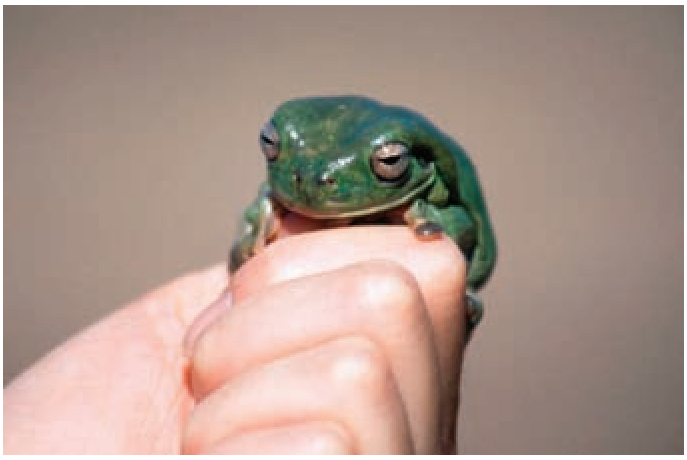

Figure 9. *Litoria caerulea.*

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[6] He notes that the information on which the myth is based came mainly from Biragidji at Yirrkala [Birrikidji or Birrikitji was Gawirrin̲ Gumana's father] and Djawa of Milingimbi (1975:243).

[7] 'Totemism is a form of religion in which groups or individuals are linked to nature. They establish natural relationships with spiritual beings, who may be species or animals' (Williams 1982:71-72).

[8] "The goal of a Dhal̲wangu singer is to 'tell the story' or 'point a picture' of those places through his song texts. … A complex, multilayered description of a place using a variety of image tropes is likely to produce an emotional reaction as listeners form a mental image of the place" (Toner, 2001: 137-48, 158).

The plant and the animal kingdoms are one for Yolngu people and are linked totemically as relatives. Animals and plants are not only an integral part of ancient mythologies but also part of contemporary kinship systems. Kinship terms are used to describe relationships with some of the totems. All the Dhal̲wangu people call *Garkman*, the frog, *märi*[9] (mother's mother). The *märi – gutharra*[10] (grandmother / grandchildren) relationship is extremely important, sometimes referred to as the "backbone" of Yolngu society[11]. As told by Gawirrin̲ Gumana, frogs can not be eaten because they are one of the Dhal̲wangu's totems and also because people never ate them before in north-east Arnhem Land.

> We always had plenty of food, kangaroos, emus, fish, tortoises…. We can sing and paint the frog and we can think about the frog, for he is *Garkman*, our country man. Some animals, like birds, sometimes fish can eat it, but not man, not Dhal̲wangu people.

Yolngu have developed different classificatory systems, called "existence classes" by Rudder (1978-79: 352). Dhal̲wangu zoological classification is complex and based on close observation of nature, as related by Bobby Wunungmurra:

> *Warrakan* [one of the existence classes] regroups all the animals you can eat. *Bowarran / Wain* is used for big animals. You have the coastal animals you can find in the sea:
>
> - *Guya* (fish)
> - *Miyapunu* (turtles, dugong)
> - *Maranydjalk* (stingray)
> - *Maypal* (shellfish, crabs, crustaceans, mangrove worms)
>
> And the inland animals:
>
> - *Wain* divided in 2 sets:
>   - Animals like kangaroo, goannas, file snakes, tortoises (short and long-neck ones)
>   - Animals with feathers like emus, ducks, goose, turkeys, …
>
> There are 4 other different sets:
>
> - *Garkman* (frogs), which is not eaten; it doesn't belong to *Wain*
> - *Gälkal* (ants)
> - *Gun̲dirr* (termites)
> - *Wurrulul* (flies) (personal communication, Bobby Wunungmurra).

Such a description approximates John Rudder's classes (1999: 9-10).

The association between water and frogs is made throughout Aboriginal Australia. For Yolngu people, *Garkman* the frog also symbolises the wet season, when fauna and flora are celebrating the renewal of life with the coming rain. In paintings and songs, *Garkman* is always associated with water. *Garkman* is associated with both rain and flood, with weather and seasonal change. *Garkman* is also associated with a grass called *Wogara* (*Chrysopogon setifolius*). *Chrysopogon* spp. belong to the Poaceae family and "are native perennial fodder plants which are deep-rooting, resistant to drought, heavy grazing, and respond rapidly to rainfall" (*Flora of Australia* 2002: 229). According to Gawirrin̲ Gumana, "*Wogara* is like a grass, with yellow flowers. *Wogara* can sing to call the rain and with the rain comes the frog". Bobby Wunungmurra said: "Wo, Wo", that is the *manikay* [song] for *Wogara*; when you don't know *Wogara*, you think it is a frog, but the sacred grass is calling. *Wogara* symbolises the *gapu* [water] coming out of the ground. With the rain, *Wogara* talks and symbolise the *gapu*."

Other important totems of the Dhal̲wangu clan, linked with *Garkman*, are *Minhala*, the freshwater tortoise (*Chelodina rugosa*); *Dakawa*, the freshwater yabby (*Cherax sp.*; Fig.10); *Gany'tjurr*, the white-faced heron (*Ardea novaehollandiae*); *Galayrr*, the white heron (*Ardea sp*); *Wurran* the cormorant (*Phalacrocorax sp.*); *Baypinnga*, the Saratoga fish (*Scleropages jardini*; Fig.11); *Balin*, the barramundi (*Lates calcarifer*); and *Mundukul*, the lightning snake (*Liasis fuscus*). All these animals share the same natural habitat and cover the main types of habitat in Dhal̲wangu country. Dhal̲wangu understandings of the relations between the species are based on close observation of their natural behaviour.

The cane toad is called *Yätj Garkman* (evil or bad frog), *mulkuwu Garkman* (foreign frog), or *bathala Garkman* (big frog) and doesn't belong to any of the two moieties in which the Yolngu physical and spiritual universe is divided (Fig.12). Altman *et al.* have stated that "we cannot predict with certainty, as there have been next to no quantitative studies of the effects of the cane toads on native wildlife.

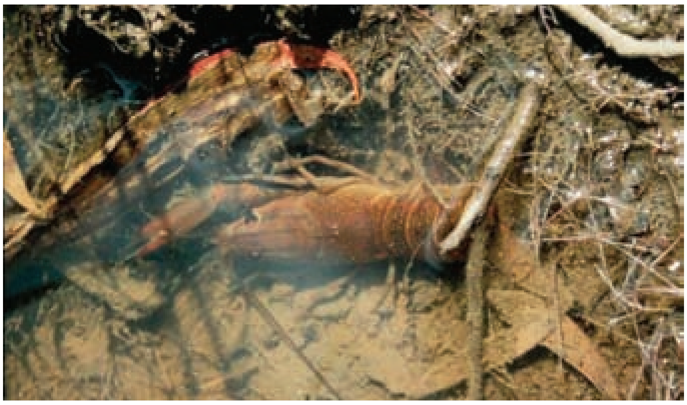

Figure 10. Dakawa, the yabby (*Cherax sp.*)

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[9] *märi*: kin category – mother's mother, mother's mother's sister, mother's mother's brother (reciprocal, *gutharra*).

[10] *gutharra*: kin category – woman's own daughter's children or person's sister's daughter's children (reciprocal, *märi*).

[11] "In the Yolngu gesture-language which uses body parts to signify kin relationships, the region of the upper back and the backbone in particular signify *gutharra* or the *märi-gutharra* relationship" Williams, 1986: 53."Yolngu refer to the *märi* as the 'giver', in both a genealogical and spiritual sense, and often said that much of what a person is comes from their *märi*." Bangara Wunungmurra (Toner, 2001: 53, See also 218; See also Keen, 1994: 110-111).

But there *will* be change" (2003: 47). The impact of this invasive toad has been noticed in many Aboriginal communities (Griffiths *et al.* 2005). Many Gäṉgaṉ and Gapuwiyak residents pointed out that the population sizes of frogs, snakes, goannas and freshwater tortoises has heavily decreased in recent years. According to Micky and Bobby Wunungmurra, the first cane toads reached Gapuwiyak in 1999 and were coming from Numbulwar. Many animals were found dead, poisoned by cane toads, including a death adder with the toad still in its mouth (Bobby), a python with two cane toads in its burst belly (Micky), king browns, blue tongue lizards, and goannas.

> The number of animals we call bush tucker is getting down. So far, the fishes don't seem to suffer from the cane toads, but you can not see any snakes anymore around Gapuwiyak. In the 1970s, there were a lot of *Dalarra* [king brown] in Balma and around; not any more. And when you go camping, you do not hear native frogs anymore, just cane toads (personal communication, Micky).

One of the reasons for this decline might be the spread of the cane toad into Arnhem Land but such an alarming reduction in wildlife has also been linked with intensive and extensive hunting. As noted by Davies *et al.*:

> While declines are most obvious around larger centralised communities, the dispersal of indigenous people to `homelands' on their own traditional country over the past 20 years has also led to increased hunting around these smaller settlements. As well as hunting, competition from feral herbivores, changed fire regimes and predation by feral animals also contribute to the decline of otherwise common native species (1994: 41).

Another factor is death caused by the spread of rubbish - animals swallow plastic bags or are trapped in tins or cans (personal communication Nawurapu Wunungmurra).

Bufo marinus is regarded as a pest - it doesn't belong to Dhaḻwangu country[12]. The cultural effects of this animal will first be the loss of traditional food (which is already felt by Yolngu people) and second an alteration of totem species, which involves an alteration of traditional ceremonies. For example, some traditional ceremonies in the Borroloola region have been altered to request the spirits to return these foods (goannas, lizards, snakes, …) and in some cases, totem species (Van Dam *et al.* 2001: ix; Seaton and Bradley 2004).

Donald Wunungmurra pointed out that cane toads are taking over all the billabongs:

> I grew up in Gäṉgaṉ, beautiful country around Gäṉgaṉ; it was easy to find, to harvest bushtuckers: waterlilies, goannas, bandicoots, fish … We are upset, not being able to find frogs anymore to get tucker [frogs as bait to fish]. We feel hurt, it is very sad; we can't find any goannas, any long-neck tortoises. It stops the interest of elders to take young ones out in the bush to find and show them bushtucker. Cane toads are shocking; they take the enjoyment and the meaning from the land. All that really affects me. I feel upset, sad, frustrated, confused. I feel like that especially for my grandchildren. Grandma, Mum and Dad took us out in the bush and we were using everything; not taking too much, sharing with the animals (not taking too much of what they ate), it is important to share. Cane toads affect me, the land, and the ceremonies. If the cane toads destroy *Garkman*, the green tree frog we sing about, it will affect how we pass on knowledge to the younger generations. The knowledge will fade away and it will affect not only Dhaḻwangu: Bobby, Micky, Nawurapu, Mr Gumana, me … but all Yolngu. No more frogs means no more stories to give, no more songs to sing, no more dances about big green frog. We will lose the real story, not being able to pass it on. *Garkman* is part of the Dhaḻwangu stories. It is very important because *Garkman* has been there in Gäṉgaṉ from the beginning[13]. Now what can we do? *Balanda* [white Australian] and Yolngu have to work

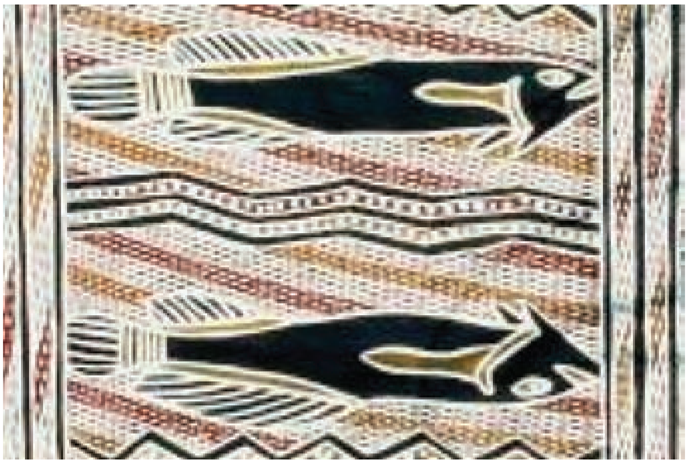

Figure 11. *Baypinnga*, the Saratoga fish (*Scleropages jardini*).

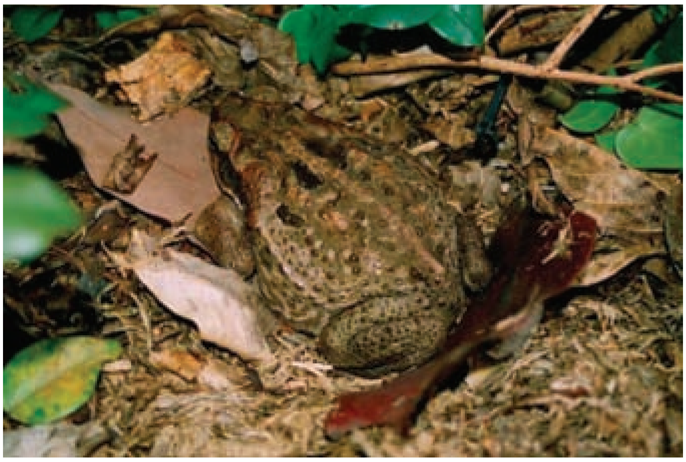

Figure 12. A cane toad, *Bufo marinus*, Gapuwiyak.

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[13] See Seaton and Bradley 2004: 212-213 regarding the role of memory.

[12] About of feral species and belonging to country see Trigger. 2002. *Indigeneity, ferality and what 'belongs' in the Australian bush: nature, culture and identity in a settler society,* paper presented at the Ninth International Conference on Hunting and Gathering Societies (CHAGS 9) Conference, Edinburgh, Scotland, September 2002: 8.

> together. Maybe make a trap, like the trap to catch fish but to catch cane toads. But how to bring cane toads in the trap? We have to work together (personal communication, Donald Wunungmurra).

Through a community effort activity in 2004, cane toads were 'humanely' eradicated from Gapuwiyak by freezing them. In four months (February to May), 1200 cane toads were caught and frozen, a number that doesn't take into account juveniles or the eggs removed from the lake and puddles. This initiative had quite an impact on cane toad populations and helped to regulate numbers. After the event a short survey was made where the toad was observed at a ratio (frog : toad) of 1:6 in Gängan̲ and only 1:3 in Gapuwiyak.

The federal government has now declared the cane toad invasion a 'key threatening process' under federal legislation (Department of the Environment and Heritage, 12 April 2005). FrogWatch North (a not for profit organisation devoted to raising environmental awareness, especially in relation to frogs) has been testing a number of traps. All are proving to be effective. One of the organisation's cage traps caught 543 toads in a six weeks period[14].

Conclusion

As mentioned by Toner (2001: 247) "Country is a central important aspect of Yolngu identity" and Dhal̲wangu have deep spiritual attachments to their country[15] (*Wänga*). The importance of maintaining a connection with their traditional country continues to be fundamental for Yolngu people. Above all, further research may support any traditional knowledge concerning the significance of amphibians in Aboriginal culture and highlight the possible impacts of *B. marinus* on totem species. Given the possibility that *B. marinus* will have an impact on frog species, it is important to continue scientific research within remote areas of north-east Arnhem Land. Research on areas where the toad already exists may act as a useful precursor to the possible impact of *B. marinus* on what are presently considered intact frog populations in similar habitats around Darwin.

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[14] See 2005 FrogWatch trap trial report observations at http://www.frogwatch.org.au/documents/file store/902CB532-C09F-44B0-F13ECC88E9295DDC.pdf.

[15] See Keen, 1994: 102ff; Williams, 1986.

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